

REMARKS

A Petition for Extension of Time is being concurrently filed with this Amendment. Thus, this Amendment is being timely filed.

Applicants respectfully request the Examiner to reconsider the present application in view of the foregoing amendments to the claims and the following remarks.

Status of the Claims

Claims 1-10 and 13-21 are currently pending and stand ready for further action on the merits for the above-identified application. All claims cancelled or amended were done so without prejudice or disclaimer. Claims 9-10, 17 and 20-21 were cancelled. Claims 1, 5-8, 13, and 18-19 are presently amended. No new matter has been added by way of amendment. Claim 1 was amended to depend from method claim 6. Claim 5 was amended to include “50% volume or more of the spherical molding sand” which has support within the present specification at page 8, lines 7-21. Claim 6 was amended to be placed into independent form, as suggested by the Examiner. Support for claim 6 can be found on page 12, line 5, to page 13, line 25 of the present specification. Claims 7-8 and 18-19 were amended to include further structural and/or mechanical properties of the casting mold itself, as suggested by the Examiner. Support for claims 7-8 and 18-19 can be found on page 14, lines 6-10 of the present specification. Claim 13 was amended to depend from claim 6 since claim 17 was cancelled. Thus no new matter has been added.

Based upon the above considerations, entry of the present Amendment is respectfully requested.

Examiner Personal Interview

Applicants' representative thanks the Examiner for extending the courtesy of the telephone interview conducted on June 24, 2008. Applicants' representative discussed the above case with the Examiner in an effort to resolve the outstanding issues within the Office Action of March 18, 2008 (hereinafter "Office Action"). Prior to the interview, Applicants' representative provided an exhibit showing a comparison between the spherical molding sand of the present invention, which is produced by a flame fusion method, and the ceramic sand of the prior art which is a product of a granulation calcination method.

Based on the Interview Summary of the Examiner, Applicants' representative finds the substance of the interview of the Examiner Interview Summary, referenced above, to be accurate.

Specifically, the Examiner mentioned that there is potentially allowable subject matter if the method claims 6 and 17 were written in independent form and that the spherical molding sands were dependent product by process claims depending from claims 6 and 17.

The Examiner also indicated his belief that the casting molds and cast products within claims 7-10 and 18-21 are not adequately defined as to the structural parameters, physical characteristics and/or material properties that make up these mold and cast products. Since the Examiner believes there is not enough of this type of structure within these claims, the Examiner recommended that claims 9-10 and 20-21 (and to a somewhat lesser extent claims 7-8 and 18-19) be cancelled.

With regards to the submitted exhibit, Applicants' representative then proceeded to discuss the differences of the present invention, as displayed on the left side of the exhibit, to that of the cited references JP 08090150 (hereinafter "JP '150") and Anzai *et al.*, U. S. Patent No. 4,923,520 (hereinafter "Anzai") which was displayed on the right side of the exhibit.

The spherical mullite based ceramic sand of JP '150 is prepared by a granulation calcination method that was depicted in the exhibit. The granulation calcination method within JP '150 cannot produce ceramic sand having a high spherical degree as the images within the exhibit indicated.

Additionally, Applicants' representative pointed out that Anzai actually teaches away from using spherical fused silica of 50 μm or greater (see Anzai column 3 lines 60 to 68) and that Anzai mentions that "proportions of particles that are not fully fused, e.g., which do not become non-crystalline throughout, or which are not fully spherical in shape, increase when fused silica having an average particle diameter above 50 μm is to be produced."

In addition, the particle sizes of JP '150 (>500 μm) and Anzai (<50 μm) were discussed as being incompatible in combination, based on the teachings in Anzai, discussed above.

The Examiner indicated that the exhibit was very helpful in understanding the present invention from that of the prior art.

The Examiner suggested that the pictures, properties for each of the particles (such as spherical smoothness, sphericity, particle distribution, strength, fluidity, etc.), and an English translation of the processes within the exhibit (or translate the exhibit into English) be placed within a Declaration. The Examiner stated that this type of exhibit would be very good evidence, in the form of a 37 C.F.R. § 1.132 Declaration, to help overcome the present rejection. The

Examiner stated that a Declaration and claim amendments (like the ones discussed above) should overcome the rejection.

Additionally, the Examiner thought that the arguments regarding the particle sizes used in the present invention as compared to the cited art would be persuasive within a Declaration.

The Examiner indicated that if the above were submitted (Declaration and amended claims) within the next response, the rejections should be overcome. We inquired whether the Examiner would allow the claims if the above was followed. The Examiner stated he could not indicate that the claims would be allowed until a new search would be performed.

Request for Continued Examination (RCE)

As indicated in the Examiner Interview Summary dated June 30, 2008, the Examiner suggested filing a RCE (rather than an after final amendment), since the claim amendments are substantial and a newly provided Declaration would raise new issues that would require further consideration and additional searching.

As suggested by the Examiner, Applicants herein file a RCE.

37 C.F.R. § 1.132 Declaration

As indicated to the Examiner during the interview, a 37 C.F.R. § 1.132 Declaration of Mr. Mikio Sakaguchi is enclosed with the instant reply.

The Examiner is respectfully requested to review the enclosed Declaration at this time, as it is material to a consideration of whether the cited references anticipate or renders obvious any of instantly pending claims 1-8, 13-16 and 18-19.

Issues Under 35 U.S.C. § 102(b), or in the Alternative, 35 U.S.C. § 103(a)

Claims 1, 2, 4, 7-10, 13, 15, and 18-21 stand rejected under 35 U.S.C. § 102(b) as anticipated by or, in the alternative, under 35 U.S.C. § 103(a) as obvious over JP '150.

The Examiner asserts that JP '150 teaches the claimed casting including steel product produced by the claimed casting mold, wherein the casting mold is produced by spherical mullite based ceramic sand 8 containing 61.7 : 35.5 Ratio of Al_2O_3 and SiO_2 and size of 0.5-1.5mm, wherein the spherical degree of the mullite sand of less than 0.95.

The Examiner states that the spherical mullite based ceramic sand 8 is not produced by the process of fusing in flame.

However, the Examiner asserts that the claimed sand, mold, casting and construction products are still obvious over JP '150, since the spherical mullite based ceramic sand 8 has the claimed properties and after casting, casting molds are removed from the casting products.

Applicants have cancelled, without prejudice or disclaimer, claims 9-10 and 20-21, thus obviating the rejection as to these claims. Applicants respectfully traverse the rejection concerning the remaining claims.

Legal Standard for Determining Anticipation

"A claim is anticipated only if each and every element as set forth in the claim is found, either expressly or inherently described, in a single prior art reference." *Verdegaal Bros. v. Union Oil Co. of California*, 814 F.2d 628, 631, 2 USPQ2d 1051, 1053 (Fed. Cir. 1987). "When a claim covers several structures or compositions, either generically or as alternatives, the claim

is deemed anticipated if any of the structures or compositions within the scope of the claim is known in the prior art.” *Brown v. 3M*, 265 F.3d 1349, 1351, 60 USPQ2d 1375, 1376 (Fed. Cir. 2001) “The identical invention must be shown in as complete detail as is contained in the ... claim.” *Richardson v. Suzuki Motor Co.*, 868 F.2d 1226, 1236, 9 USPQ2d 1913, 1920 (Fed. Cir. 1989). The elements must be arranged as required by the claim, but this is not an *ipsissimis verbis* test, i.e., identity of terminology is not required. *In re Bond*, 910 F.2d 831, 15 USPQ2d 1566 (Fed. Cir. 1990).

Legal Standard for Determining Prima Facie Obviousness

To establish a *prima facie* case of obviousness, three basic criteria must be met. First, there must be some suggestion or motivation, either in the references themselves or in the knowledge generally available to one of ordinary skill in the art, to modify the reference or to combine reference teachings. Second, there must be a reasonable expectation of success. Finally, the prior art reference (or references when combined) must teach or suggest all the claim limitations.

The teaching or suggestion to make the claimed combination and the reasonable expectation of success must both be found in the prior art, not in applicant's disclosure. *In re Vaeck*, 947 F.2d 488, 20 USPQ2d 1438 (Fed. Cir. 1991).

“There are three possible sources for a motivation to combine references: the nature of the problem to be solved, the teachings of the prior art, and the knowledge of persons of ordinary skill in the art.” *In re Rouffet*, 149 F.3d 1350, 1357, 47 USPQ2d 1453, 1457-58 (Fed. Cir. 1998) (The combination of the references taught every element of the claimed invention, however

without a motivation to combine, a rejection based on a *prima facie* case of obvious was held improper.).

“In determining the propriety of the Patent Office case for obviousness in the first instance, it is necessary to ascertain whether or not the reference teachings would appear to be sufficient for one of ordinary skill in the relevant art having the reference before him to make the proposed substitution, combination, or other modification.” *In re Linter*, 458 F.2d 1013, 1016, 173 USPQ 560, 562 (CCPA 1972).

Obviousness can only be established by combining or modifying the teachings of the prior art to produce the claimed invention where there is some teaching, suggestion, or motivation to do so found either explicitly or implicitly in the references themselves or in the knowledge generally available to one of ordinary skill in the art. “The test for an implicit showing is what the combined teachings, knowledge of one of ordinary skill in the art, and the nature of the problem to be solved as a whole would have suggested to those of ordinary skill in the art.” *In re Kotzab*, 217 F.3d 1365, 1370, 55 USPQ2d 1313, 1317 (Fed. Cir. 2000). See also *In re Lee*, 277 F.3d 1338, 1342-44, 61 USPQ2d 1430, 1433-34 (Fed. Cir. 2002) (discussing the importance of relying on objective evidence and making specific factual findings with respect to the motivation to combine references); *In re Fine*, 837 F.2d 1071, 5 USPQ2d 1596 (Fed. Cir. 1988); *In re Jones*, 958 F.2d 347, 21 USPQ2d 1941 (Fed. Cir. 1992).

The Supreme Court of the United States has recently held that the teaching, suggestion, motivation test is a valid test for obviousness, but one which cannot be too rigidly applied. See *KSR Int'l Co. v Teleflex Inc.*, 127 SCt 1727, 82 USPQ2d 1385 (U.S. 2007). The Supreme Court

in *KSR Int'l Co. v. Teleflex, Inc.*, *ibid.*, reaffirmed the Graham factors in the determination of obviousness under 35 U.S.C. § 103(a). The four factual inquiries under Graham are:

- (a) determining the scope and contents of the prior art;
- (b) ascertaining the differences between the prior art and the claims in issue;
- (c) resolving the level of ordinary skill in the pertinent art; and
- (d) evaluating evidence of secondary consideration.

Graham v. John Deere, 383 U.S. 1, 17-18, 148 USPQ 459, 467 (U.S. 1966).

The Court in *KSR Int'l Co. v. Teleflex, Inc.*, *supra.*, did not totally reject the use of "teaching, suggestion, or motivation" as a factor in the obviousness analysis. Rather, the Court recognized that a showing of "teaching, suggestion, or motivation" to combine the prior art to meet the claimed subject matter could provide a helpful insight in determining whether the claimed subject matter is obvious under 35 U.S.C. § 103(a).

Even so, the Court in *KSR Int'l Co. v. Teleflex, Inc.*, *ibid.*, rejected a rigid application of the "teaching, suggestion, or motivation" (TSM) test, which required a showing of some teaching, suggestion, or motivation in the prior art that would lead one of ordinary skill in the art to combine the prior art elements in the manner claimed in the application or patent before holding the claimed subject matter to be obvious.

Further, the Examiner bears the initial burden of presenting a *prima facie* case of obviousness. *In re Oetiker*, 977 F.2d 1443, 1445, 24 USPQ2d 1443, 1444 (Fed. Cir. 1992). "[R]ejections on obviousness grounds cannot be sustained by mere conclusory statements; instead, there must be some articulated reasoning with some rational underpinning to support the legal conclusion of obviousness." *In re Kahn*, 441 F.3d 977, 988, 78 USPQ2d 1329, 1336,

quoted with approval in *KSR Int'l Co. v. Teleflex Inc.*, 127 S. Ct. 1727, 1741, 82 USPQ2d 1385, 1396 (2007).

Distinctions Over the Cited Art

Based on a full review of the enclosed 37 C.F.R. § 1.132 Declaration of Mr. Sakaguchi, and the presently amended claims, Applicants believe that there is a distinction between the present invention and JP '150.

As the Examiner indicated, the spherical mullite based ceramic sand of JP '150 is not produced by the process of fusing in flame. Applicants have amended, without prejudice or disclaimer, claim 6 into an independent method claim upon which the rejected claims depend from. Because the rejected claims now depend from an independent method claim, the Examiner is required to find if each and every element as set forth in the claim, either expressly or inherently described, in a single prior art reference for an anticipation rejection to be proper. Since JP '150 does not disclose a flame fusion method, the claims at issue are not anticipated by JP '150.

In light of the above, Applicants further believe that the JP '150 reference as a 35 U.S.C. § 102(b) anticipation reference is improper. There is no anticipation or inherency because JP '150 uses a granulation calcination method instead of the flame fusion method of the present invention. Therefore, the spherical molding sand of the present invention and the ceramic sand of JP '150 are completely different.

For the convenience of the Examiner, the following text from the enclosed 37 C.F.R. § 1.132 Declaration of Mr. Sakaguchi is herein below.

A person skilled in the art would not have been able to produce a spherical molding sand of the present invention with the particles of JP '150 having particle sizes of 500 μm or more with the granulation calcination method from the disclosure of JP '150.

A person skilled in the art would not have been able to produce a spherical molding sand of the present invention based on the combination of JP '150 and Anzai, since JP '150 requires particle sizes of 500 μm or more and Anzai requires particle sizes of 50 μm or less.

In support of the above statements, below is a description of the individual molding sands that were presented to the Examiner in an exhibit during an Examiner Interview on June 24, 2008. More specifically, below are detailed explanations of each particle presented to the Examiner in the interview of June 24, 2008, along with physical characteristics of each compiled in tabular format.

Example Prepared by the Flame Fusion Method

This Example corresponds to Example 3 presented within the specification at page 16 line 14 and is discussed in detail below.

A mullite powder (synthetic mullite powder manufactured by Shibata Ceramics Co., Ltd.) containing 97% by weight of Al_2O_3 and SiO_2 in a total amount and having an $\text{Al}_2\text{O}_3/\text{SiO}_2$ weight ratio of 2.7, a water content of 0.1% by weight, an average particle size of 0.25 mm, and a major axis diameter/minor axis diameter ratio of 1.3 was used as a starting material.

This powder was supplied by using oxygen as a carrier gas to flame (about 2000 $^{\circ}\text{C}$) which was generated by combustion of LPG (propane gas) in a ratio of LPG/oxygen of 1.1 (volume ratio), to give a monodispersed spherical molding sand.

The resulting molding sand contained 98% by weight of Al_2O_3 and SiO_2 in a total amount and had an $\text{Al}_2\text{O}_3/\text{SiO}_2$ weight ratio of 2.7, an average particle size of 0.21 mm, a spherical degree of 0.99, water absorption of 0% by weight, and a particle density of 3.1 g/cm^3 . The enclosed photograph of this molding sand example is depicted on the left hand side of the enclosed figure. It can be seen from the left hand side photograph that every molding sand particle is spherical.

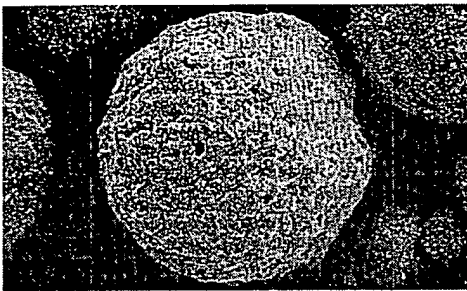
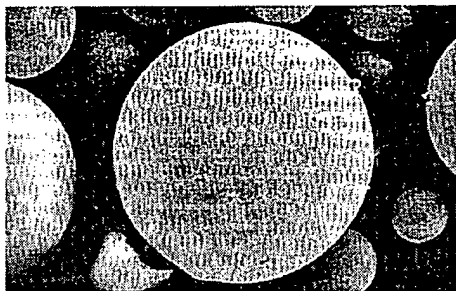
Comparative Example Prepared by the Granulation Calcination Method

This Comparative Example corresponds to Comparative Example 1 presented within the specification at page 19 line 19 and is discussed in detail below.

Powdery particles (containing 96% by weight of Al_2O_3 and SiO_2 in a total amount), which were prepared by mixing aluminum hydroxide with kaolin so as to have an $\text{Al}_2\text{O}_3/\text{SiO}_2$ weight ratio of 2.7 and subjecting the mixture to a treatment using a spray-dryer to form spherical particles, were calcined in an electric furnace at 1500 $^{\circ}\text{C}$ for 1 hour, to give a spherical molding sand. The

resulting molding sand contained 97% by weight of Al_2O_3 and SiO_2 in a total amount and had an Al_2O_3/SiO_2 weight ratio of 2.7, an average particle size of 0.18 mm, a spherical degree of 0.89, water absorption of 1.2% by weight, and a particle density of 2.7 g/cm^3 . A photograph of this molding sand is shown on the right hand side of the figure below. It can be seen from the right hand photograph within the figure below these molding sand particles have a low spherical degree and are pitted.

Flame Fusion Method Example Granulation Calcination Method Example



	Flame Fusion Method Example	Granulation Calcination Method Example
Total Al_2O_3 and SiO_2 (wt. %)	98%	97%
Al_2O_3/SiO_2 weight ratio	2.7	2.7
Average particle size (mm)	0.21	0.18
Spherical degree	0.99	0.89
Water absorption (wt. %)	0%	1.2%
Particle density of (g/cm^3)	3.1	2.7

With regards JP '150 and Anzai the following facts are asserted.

Anzai uses spherical fused silica of $50 \mu\text{m}$ or greater (see Anzai column 3 lines 60 - 68) and Anzai mentions that "proportions of particles that are not fully fused, e.g., which do not become non-crystalline throughout, or which are not fully spherical in shape, increase when fused silica having an average particle diameter above $50 \mu\text{m}$ is to be produced." (Emphasis added)

JP '150 discusses that the particle size required is from $500 \mu\text{m}$ to $1500 \mu\text{m}$ (see Abstract). Since Anzai uses particle sizes less than $50 \mu\text{m}$ and indicates that a particle size of $50 \mu\text{m}$ or greater produces particles not spherical in shape, and since the particle sizes of JP '150 are greater than $500 \mu\text{m}$, one skilled in the art would not be motivated to combine JP '150 and Anzai to make or use the spherical molding sand of the present invention.

Therefore, the present application is patentably distinguished from the disclosures of each of JP '150 and Anzai.

Specifically, as shown in the enclosed 37 C.F.R. § 1.132 Declaration of Mr. Sakaguchi, a person of ordinary skill in the art would not have been able to produce a spherical molding sand with the ceramic sand of JP '150. The enclosed 37 C.F.R. § 1.132 Declaration shows that the spherical mullite ceramic sand produced by the calcination method is not the same as the spherical molding sand of the present invention. The photographs and data within the declaration indicate that the one skilled in the art would not have been able to produce spherical molding sands of the present invention by the JP '150 reference.

Such facts set forth in the enclosed 37 C.F.R. § 1.132 Declaration of Mr. Sakaguchi evidence both the novelty and non-obviousness of the instant invention as recited in pending claims 1-8, 13-16 and 18-19 over the disclosure of JP '150. Any contentions of the USPTO to the contrary are not sustainable and therefore must be reconsidered at present.

In light of the Interview, the enclosed 37 C.F.R. § 1.132 Declaration, the cited case law above, the lack of disclosure of all features as instantly claimed, the rejection in view of JP '150 is overcome and/or rendered moot.

Further, because no teaching, disclosure, reason or rationale is provided in the cited JP '150 reference that would allow one of ordinary skill in the art to arrive at the instant invention as claimed, it follows that the same reference is incapable of rendering the instant invention obvious under the provisions of 35 USC § 103(a).

Applicant respectfully requests reconsideration and withdrawal of the present rejection.

Issues Under 35 U.S.C. § 103(a)

Claims 3, 5, 6, 14, 16, and 17 stand rejected under 35 U.S.C. § 103(a) as unpatentable over JP '150 in view of Anzai.

The Examiner states that JP '150 fails to teach the use of particular low water absorbency in specifying the molding sand (in claims 3 and 14), and fails to teach the use of fusing in flame (in claims 6 and 17). However, the Examiner asserts that Anzai teach the use of fusion in flame process for the purpose of promoting fused silica having spherical degree of more than 0.99, or 99 volume percent, are in perfect spherical form and water absorption of about 0.21 wt% and less than 0.8 wt%. The Examiner further asserts that it would have been obvious to one having ordinary skill in the art to provide JP '150 the use of molding sand having low water absorbency in specifying the molding sand and the use of fusing in flame process, as taught by Anzai, in order to improve flowability, degassing and promote mechanical strength.

With regards to claims 5 and 16, The Examiner states that JP '150 in view of Anzai, fails to teach the use of 50% of spherical molding sand. However, The Examiner asserts that the use of 50% of spherical molding sand in the mixture of molding sand would have been obvious to one having ordinary skill in the art, in order to provide the mixed molding with improved flowability, degassing and promote mechanical strength. Applicants respectfully traverse.

Legal Standard for Determining Prima Facie Obviousness

Applicants incorporate by reference the cited legal standard from the above rejection.

Distinctions Over the Cited Art

Based on a full review of the enclosed 37 C.F.R. § 1.132 Declaration of Mr. Sakaguchi, and the presently amended claims, Applicants believe that there is a distinction between the present invention and the combination of JP '150 and Anzai. In fact, these references are not combinable based on their respective disclosures.

Applicants herein incorporate the above discussion regarding JP'150, above, by reference.

As indicated above, JP '150 uses ceramic sand. As indicated by the Examiner the particle size of the ceramic sand in JP '150 is greater than 500 μM (500 to 1500 μM , See JP '150 Abstract).

As previously argued, Anzai actually teaches away from using spherical fused silica of 50 μm or greater (see Anzai, column 3 lines 60 to 68). Anzai mentions that "proportions of particles that are not fully fused, *e.g.*, which do not do not become non-crystalline throughout, or which are not fully spherical in shape, increase when fused silica having an average particle diameter above 50 μm is to be produced."

It appears that Anzai reinforces this limitation in the technology by indicating in the Manufacturing Example, Examples 1-10 and Table 1 that the spherical fused silica were less than 50 μm in diameter (see Anzai, column 4, line 8 to column 6 line 15). One skilled in the art therefore would not use Anzai to produce spherical fused silica of 50 μm or greater due to Anzai *et al*, warning of producing inferior quality and shape of the fused silica spheres.

Since Anzai requires spherical fused silica of 50 μm or greater and JP '150 requires ceramic sand that is greater than 500 μm in particle size, the reference cited by the Examiner are not combinable.

Since JP '150 fails to teach or suggest the flame fusion method of the present invention which produces ceramic sand having high a spherical degree, Anzai teaches that using fused silica particles greater than 50 μm or greater produce fused silica that are not fully spherical in shape, a skilled artisan is not motivated to combine both JP '150 and Anzai to produce the process or the spherical molding sand of the present invention. For such reasons, the rejection is without basis and should be withdrawn.

The enclosed 37 C.F.R. § 1.132 Declaration of Mr. Sakaguchi shows that the spherical mullite ceramic sand produced by the calcination method is not the same as the spherical molding sand produced by the flame fusion method of the present invention. The photographs and data within the declaration indicate that the one skilled in the art would not have been able to produce spherical molding sands of the present invention by the JP '150 reference.

In light of the Interview, the enclosed 37 C.F.R. § 1.132 Declaration, the cited case law above, the lack of disclosure of all features as instantly claimed, that fact that the references are not combinable, the rejection in view of JP '150 and Anzai is overcome and/or rendered moot.

Further, because no teaching, disclosure, reason or rationale is provided in the attempted combination of JP '150 and Anzai (which Applicants contend they cannot be combined) that would allow one of ordinary skill in the art to arrive at the instant invention as claimed, it follows that the same reference is incapable of rendering the instant invention obvious under the provisions of 35 USC § 103(a).

Applicant respectfully requests reconsideration and withdrawal of the present rejection.

CONCLUSION

In view of the above comments, Applicants respectfully submit that instant claims 1-8, 13-16 and 18-19 are allowed and patentable under the provisions of title 35 of the United States Code. A notice to such effect is earnestly solicited at present.

Should there be any outstanding matters that need to be resolved in the present application, the Examiner is respectfully requested to contact Paul D. Pyla, Reg. No. 59,228, at the telephone number of the undersigned below, to conduct an interview in an effort to expedite prosecution in connection with the present application.

If necessary, the Commissioner is hereby authorized in this, concurrent, and future replies to charge payment or credit any overpayment to Deposit Account No. 02-2448 for any additional fees required under 37.C.F.R. §§1.16 or 1.14; particularly, extension of time fees.

Dated: JUL 18 2008

Respectfully submitted,

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Attachment: 37 C.F.R. § 1.132 Declaration of Mikio SAKAGUCHI